

NUCLEAR INTELLIGENCE WEEKLY®

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WEEKLY ROUNDUP

Newbuild Momentum on the Back of IAEA Ministerial

- Major nuclear gatherings in Washington, including the International Atomic Energy Agency's ministerial conference, provided a backdrop for further newbuild momentum, starting with Canada Infrastructure Bank's Oct. 25 pledge of CA\$970 million (US\$715 million) for developing the world's first-of-a-kind BWRX-300 small modular reactor (SMR) at Ontario Power Generation's (OPG) Darlington nuclear power plant site. The financing covers all pre-nuclear construction work, "including project design, site preparation, procurement of long lead-time equipment, utility connections, implementation of a digital strategy, and related project management costs," said OPG. Meanwhile the US and Japan launched a project to support an SMR deployment in Ghana, the first phase of which will be an SMR feasibility study conducted by Japan's IHI Corp. and JGC Corp., and US-based Regnum Technology Group and NuScale Power. TerraPower and regulated utility PacifiCorp on Oct. 27 announced a joint study into the deployment of five TerraPower Sodium sodium-cooled fast reactors and integrated energy storage systems within the utility's service area by 2035, beyond the inaugural unit planned in Kemmerer, Wyoming. The "lasting gains" from the energy crisis sparked by Russia's invasion of Ukraine "accrue to low emissions sources, mainly renewables, but also nuclear," the International Energy Agency noted in its annual World Energy Outlook, released Oct. 27.
- Urenco CEO Boris Schucht tried to assuage nuclear fuel supply concerns amidst a shift away from Russian supplies by Western utilities. Post-Fukushima over-capacities at enrichers "still exist," Schucht said. "You can operate these fleets differently," such as "not underfeeding anymore." Enrichers "could even go to overfeeding," producing "much more enriched uranium." With this "high flexibility" Schucht argued "there is no customer who should be afraid not to get supplied anymore." But overfeeding requires a sufficient UF6 supply, and conversion capacity is already tight, exacerbated by ongoing technical problems at Orano's UF6 conversion complex. Meanwhile in the US a proposed bipartisan ban on Russian nuclear fuel supplies beginning in 2025 is expected to go to a vote following November's mid-term elections. This risks a retaliatory supply cut-off by Moscow earlier than 2025, and while Western utilities are expediting contracted shipments of Russian nuclear fuel, even Rosatom has limits on how quickly it can ramp up capacity to advance deliveries.
- EDF increased the estimated impact of domestic nuclear outages on its bottom line from -€29 billion (-\$29 billion) to -€32 billion this week in its third quarter results. The French nuclear powerhouse has been beset by unplanned outages thanks in part to a stress corrosion phenomenon that requires key piping components to be cut out for analysis and possible repair. With roughly half the fleet out of service, however, there appears to be some progress among a group of 10 reactors shut down specifically for suspected corrosion. As of this week, three showed no signs of the problem while repairs at three others were completed; work continues on the remaining four. Beyond that investigations are "ongoing" at an additional five reactors. Meanwhile EDF's incoming CEO Luc Remont pledged to the French Parliament that he will restart reactors "as soon as possible" and promised a roadmap as to how EDF will meet its long-term challenges.

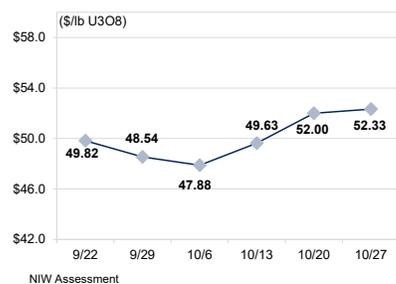
Market Points

Cameco and Kazatomprom revealed surges in ordering in third quarter reporting, reflecting a wave of term uranium contracting by established operators.

This provided support for upward movement in the U3O8 spot price, although a bigger factor—once again—was buying by intermediaries.

Supply chain disruptions and transport issues continue to cause headaches, particularly for production and shipment out of Kazakhstan.

UPP: \$52.33/LB U3O8



NUCLEAR FUEL MARKET

Return of Long-Term Demand?

A wave of long-term nuclear fuel contracting by established operators appears underway, as two of the world's leading uranium producers this week reported a surge in marketing activity in their quarterly reports.

While Cameco has locked in an additional 5 million pounds U₃O₈ of contracted long-term demand — lifting its order book from the 45 million lbs. U₃O₈ reported in the second quarter to 50 million lbs. today — another 27 million lbs. has been “accepted,” CEO Tim Gitzel said in an Oct. 27 conference call. “While the contracts” for those additional pounds “are not yet finalized, the key terms including pricing mechanism, volume, and tenor have all been agreed,” said the head of the Saskatoon-based nuclear fuel producer.

Kazatomprom doesn't report its long-term order book, but it did reveal an enormous jump in sales for the first nine months: from 6,800 tU (17.7 million lbs. U₃O₈) to 12,230 tU (31.8 million lbs.), or a jump of “almost 80%”, Chief Financial Officer Kamila Syzdykova told an Oct. 26 investor day at the company's Astana headquarters. “We work according to the customer requests, so as the requests change the deliveries will change as well,” said Syzdykova. Total 2022 Kazatomprom sales are now estimated at 13,400 – 13,900 tU, which as with those other figures includes sales from Kazatomprom and its trading subsidiary but not from all of the producer's joint-venture partners.

Even juniors are taking advantage of this upsurge of utility interest. Last week Australia's Paladin, which is bringing its Langer Heinrich mine in Namibia back online, reported that in the quarter ending Sep. 30 it had “secured an additional four tender awards for the supply of uranium to industry leading counterparties in the US and Europe and is working towards finalising contract terms.”

All of this has helped buttress the uranium spot market, but the rise in the spot price over the past two weeks is likely thanks more to intermediaries. One trader bought considerable amounts of material over the past two weeks, and then on Oct. 27 Sprott Asset Management's physical uranium trust (Sput) swooped in to pick up 200,000 lbs. U₃O₈.

On the back of this activity Energy Intelligence's Uranium Price Panel delivered an average price assessment of \$52.33/lb. U₃O₈ for Thursday, Oct. 27, up from \$52.00/lb. last week.

Continued Logistical Concerns

Meanwhile Kazatomprom confirmed that there were more supply chain and operational issues ahead. Continued Covid-19-related supply chain disruptions, including shortfalls to reagents and piping, delayed the schedule for commissioning new wellfields, which in turn saw production in the first nine months fall short “of internal expectations.” And while Kazatomprom is maintaining its 2022 production plan of 21,500 tU (on a 100% basis), “final year-end volumes could fall short if wellfield development and supply chain issues continue throughout the fourth quarter of the year,” the group warned in its quarterly filings.

It doesn't end there, either. For 2024 Kazatomprom is targeting 25,000–25,500 tU of Kazakh output, a mild increase over the 2023 target of 22,800 tU. But even that modest increase may face “significant challenges” based on “the current state of global supply chains and the availability of key operating materials.” With that in mind Kazatomprom presented plans for a new sulfuric acid plant to Kazakh Prime Minister Alikhan Smailov earlier this month.

Finally, both Kazatomprom and Cameco confirmed that a shipment from their Inkai joint venture destined for Cameco's Blind River facility is delayed in Azerbaijan on the new route from Kazakhstan through the Caspian Sea — an alternative to shipping through Russia. A vessel containing the first batch of material destined for France's Orano is in the Georgian Black Sea port of Poti, awaiting the second batch of Kazakh-uranium from Inkai. The first batch had already received Azeri government approval for onward shipment, and Energy Intelligence understands that the French recipients of the material were proactive in engaging with export officials there. Baku is determined to engage with all stakeholders involved, and this appears to be holding up the Inkai batch.

Jessica Sondgeroth, Washington, Phil Chaffee, London

URANIUM PRICE PANEL

For the week ended October 27, 2022

	Chg.	Weekly Spot Market Prices												
		Oct					Sep					Aug		
		27	20	13	6	29	22	15	8	1	25	18	11	4
Price (\$/lb U ₃ O ₈)	0.32	52.33	52.00	49.63	47.88	48.54	49.82	50.03	51.83	52.50	48.38	47.75	47.63	47.84
Total Assessments	-1.00	9.00	10.00	12.00	9.00	8.00	10.00	10.00	8.00	8.00	9.00	10.00	9.00	8.00
% within 1 StDev	-3.33	66.67	70.00	83.33	77.78	87.50	60.00	70.00	75.00	62.50	77.78	80.00	77.78	75.00
Low (\$/lb U ₃ O ₈)	0.40	51.90	51.50	49.00	47.50	48.25	49.00	49.00	51.25	52.00	48.00	47.50	47.25	47.50
High (\$/lb U ₃ O ₈)	0.50	53.00	52.50	50.50	48.25	49.00	51.00	51.00	52.00	53.50	49.00	48.25	48.00	48.25
Variability*	-0.14	0.11	0.25	0.75	0.07	0.08	1.00	0.38	0.19	0.39	0.38	0.25	0.04	0.00

*This represents the value of the potential range of conceivable final averages that might result when random elimination is used to balance market positions within the panel.

FINANCING

A Reality Check for Advanced Reactor Developers

Advanced reactors, including small modular reactors (SMRs), have yet to meaningfully attract interest from the institutional investment community, because at this still relatively early point in the development stage, the risks are too high. Even in the pro-nuclear US Department of Energy (DOE), which is providing billions for R&D on such reactors, the Loan Program Office has yet to be convinced it has a worthy case for financing a specific advanced reactor project.

There is no shortage of official support for new nuclear — as seen at this week's International Atomic Energy Agency (IAEA) Ministerial Conference on Nuclear Power and the Carnegie International Nuclear Policy Conference in Washington, where leading advocates repeatedly cited energy independence and climate change as key reasons. But obtaining DOE project finance requires being able to convincingly demonstrate reliable and adequate supply and customer demand — a message conveyed at another nuclear event this week in Washington. Most if not all SMR developers are still a long way from being able to do that.

“The only message I want to leave you with is that no one really understands your plans,” DOE Loan Program Director Jigar Shah said at the US Nuclear Industry Council's (NIC) New Nuclear Capital symposium on Oct. 24. “No one really understands how you commercialize nuclear power.”

Shah pointed to the GE-Hitachi BWRX-300 SMR, which is essentially a scaled-down boiling water reactor, as an example of why there is investor confusion, despite contracts to deploy the technology with SaskPower and Ontario Power Generation (OPG) in Canada and Tennessee Valley Authority (TVA) in the US.

Shah said that beyond the basics — namely that GE-Hitachi is providing the design while nuclear fuel services provider BWX Technologies (BWXT) will manage procurement for key reactor components— there is no single contractor for managing these projects. Instead, TVA plans to use its experience to construct the plant at its Clinch River site in Tennessee, and OPG plans to do the same at its Darlington site in Ontario. SaskPower, on the other hand, has yet to identify a site or a contractor. So, asked Shah, how do you explain to investors how all these moving pieces coalesce into a viable commercial future for the reactor?

A few projects are not enough to convince potential lenders, he added, saying the DOE loan program office needs to see a taller order book before it will agree on any government loans. And that's a challenge because utilities are for the most part conservative: In countries like Romania and Poland, for example, prospective buyers would like to see the technology developed in the US before signing any firm contracts.

“SMRs are very exciting,” Shah said. “But at the end of the day,” it's a challenge to “get 10 of these things assembled, because utilities are saying we want to be number 27 in line” to add a nascent reactor design to their energy portfolio.

Loan Program

With a career built on the financing of renewable projects, Shah took the helm as director of the DOE's Loan Program Office in March 2021, which was tasked by Congress in late 2020 with implementing some expansive revisions to the loan guarantee statute, and administering more than \$40 billion in loan guarantees to commercialize clean energy technologies, including about \$8.9 billion for nuclear power facilities.

Eligibility extends to uprates at operating reactors, upgrades at both non-operating and operating reactors, in addition to advanced reactor projects with state-of-the-art design improvements, and nuclear-generated hydrogen production. Another \$2 billion is available for “front-end” fuel cycle technologies, including conversion, enrichment, and fuel fabrication, although the only eligible applicants so far are vendors using existing and proven technologies, Energy Intelligence understands.

Loan applicants are not eligible for federal loan or loan guarantees until their respective technology is ready for commercial deployment. However in 2020 Congress amended the DOE's loan guarantee statute to allow applicants to at least begin the loan application process earlier and to push due diligence from the second phase of the process to the final third phase that includes term sheet negotiations. The expanded process is meant to give more credibility to vendors seeking offtake agreements.

Only one vendor, Holtec International, has announced it is applying for the program, seeking \$7.4 billion for construction of four SMR-160s and the corresponding manufacturing capacity. Holtec submitted paperwork to begin the second phase of the loan process in July.

This week it announced a “memorandum of agreement” with the CEZ Group's Skoda Praha, an EPC contractor for power plants, and South Korea's Hyundai Engineering and Construction, for advancing plans to build SMR-160s in the Czech Republic. The agreement, signed Oct. 11, outlines responsibilities for procurement, construction, and commissioning and commits the parties to come up with a cost estimate for deploying the SMRs in the Czech Republic. That may put the vendor closer to deployment, but Energy Intelligence understands the loan programs office would prefer to see at least 10 orders in an SMR vendor's contract book before administering any debt financing.

Missing the Message

Underlining Shah's message, another speaker at the NIC symposium said there needs to be more strategic and cohesive cooperation between developers, suppliers, and contractors to sell potential

investors on a reactor concept, including integration of hydrogen production, for example.

“Nuclear hasn’t done a very good job of articulating how it can fill more market niches than people are used to thinking about and that it can potentially create new market applications for electricity,” tech venture capital firm DCVC Principal Rachel Slaybaugh said at the NIC event on Oct. 24. “I think articulating that narrative starts to offer a value proposition people aren’t used to hearing.”

TerraPower highlighted some of these challenges after its recent \$750 million private placement. TerraPower is developing the 345-megawatt sodium-cooled fast reactor Natrium under the DOE’s Advanced Reactor Demonstration Program, alongside X-energy’s high-temperature gas-cooled reactor, the Xe-100.

“We realized we had to cast a broad net,” TerraPower Executive Vice President and Chief Financial Officer Marcia Burkey said at the NIC event. “Nuclear demonstration first of a kind is not an easy sell, so we went to global capital providers,” including sovereign wealth funds and venture capitals, but found a warmer reception among private equity, strategic investors and family wealth management funds.

Citing a growing recognition that nuclear will be part of the future energy mix, Burkey said “there are concerns about loan construction cycles, regulatory predictability, on the predictability of price on nuclear newbuilds, and on-again-off-again government support.”

Jessica Sondgeroth, Washington

CHINA

Will the CFR-600 Deploy in 2023?

As China visibly accelerates its nuclear power program to address intensifying energy security concerns, the country’s breeder champions are boasting of progress in their grand vision of achieving a commercially viable closed fuel cycle by “around 2035,” according to the latest update on the program by the China Institute of Atomic Energy (CIAE), which is spearheading the R&D effort. This update, given in Vienna last month, prompted more questions than answers, however.

The first of the twin “demonstration” CFR-600 fast breeder reactors under construction at Xiapu, Fujian province, is on schedule for completion in 2023, the CIAE’s Hongyi Yang said at a Sep. 28 side event at the International Atomic Energy Agency’s annual general conference. Yang outlined many well-known goalposts in the basic program — such as achieving commercial reprocessing and mixed-oxide (Mox) fuel fabrication capability by 2035, along-

side completion and operation of the CFR-600s. But there was frustratingly little detail about how these goals would be achieved.

“The presentation didn’t provide any information about how the program is being managed including for how many reactors,” said Mark Hibbs, of the Carnegie Endowment. “There were a whole lot of end dates but what are the milestones in between?”

First and foremost is the question of the 2023 goalpost, which if met, would represent a major achievement considering that the first concrete pour for the reactor was not even five years ago. No other country has built and begun operating a first-of-its-kind industrial-scale fast reactor in five years, and if China is on target to do so “then they’re making progress at a much faster rate than many people have thought possible,” says Hibbs.

Another question surrounds China’s reprocessing program. Since the mid-2000s Beijing looked to France to build an 800 tons of heavy metal (tHM) per year plant. By 2010, Hibbs said, in France the Chinese/French project was coming under internal and external political pressure to be dropped in light of rising national security concerns, and Chinese experts instead advocated building an indigenous facility, as noted in his book, the *Future of Nuclear Power in China*.

Four years later, in 2015, plans for a Chinese-built reprocessing complex at Jinta leaked to the Chinese press and were subsequently elaborated on by Chinese nuclear expert Hui Zhang; but it wasn’t until April 2019 that a China National Nuclear Corp. (CNNC) executive acknowledged to Energy Intelligence that work on a first 200 tHM/yr Jinta demonstration plant was already under way.

Even so, as late as February 2021 Orano CEO Philippe Knoche told Energy Intelligence that discussions with Beijing on a commercial reprocessing plant deal were still taking place, with a French team in China despite Covid-19, and when construction of a reprocessing plant was prioritized in China’s 14th Five-Year Plan (2021-25), some industry sources interpreted that as a hopeful sign for those efforts. Hibbs said that if the 800 tHM/yr target remains in place, China may go forward toward the 2030s by incrementally setting up additional 200 tHM/yr modules.

Demonstration CFR-600s

While reprocessing plans were receding into the future at the start of the last decade, China was making progress on the reactor side, starting with an “experimental” fast-reactor project of 20 megawatts — sited just 45 kilometers southwest of Beijing city center — that became operational in 2011. Construction of the two Xiapu CFR-600s, owned and operated by CNNC, began in December 2017 and on Dec. 27, 2020, respectively.

The CFR-600 demonstration reactors are designed to accept Mox fuel, but “the first loading” will be done with uranium dioxide, according to Yang. Energy Intelligence has long understood that the plan is to use Russian-supplied highly-enriched uranium for

the first seven years, followed by Mox fuel likely fabricated at the Jinta complex where a 20 tons per year demonstration Mox fabrication facility is expected to be commissioned in 2025.

With completion of the first CFR-600 apparently in sight, China has now progressed to the “middle” of the second step in its three-step strategy for fast breeder reactor development, said Yang. The third and final step targets the post-2030 time frame, when CIAE envisages having a fleet of even larger “commercial” fast reactors — CFR-1200s each of 1,200 MW — in operation, Yang elaborated.

“Commercial fast reactor will be deployed in early 2030s,” said Yang. By around 2030–35, CIAE hopes to realize “a commercial demonstration” system comprising a fast reactor complete with an 800 ton/yr fuel reprocessing facility and Mox fabrication plant.

The eventual goal — in the post-2050 era — is for China to achieve a “closed nuclear fuel cycle” ensuring that it would not face uranium fuel crunches. This entails having CFR-1200s contained within an “Integrated Fast Reactor Energy System” (Ifres) that is equipped with fuel “breeding” and reprocessing capability, according to Yang.

For reprocessing technology, CIAE has selected the aqueous and pyro technologies on which “the R&D work [has] already originated ... under verification scale,” Yang elaborated. “In the future, we want to host an Ifres system, that means an advanced system [incorporated] with [plutonium] metal fuel production in one site and [that] can be an independent cycle system.”

China’s Ifres concept appears akin to what France and early nuclear planners in the US and other countries once hoped for, and which Russia and Japan still doggedly pursue. But the dream of creating a fleet of plutonium-fueled reactors that produce more plutonium than they consume is still far from being achieved and to many experts remains no more than a distant mirage.

Kim Feng Wong, Singapore, Stephanie Cooke, Washington

WASTE

Taiwan’s Repository Plans Under Fire

Taiwan’s powerful Control Yuan says it may be impossible to site a final underground repository for spent nuclear fuel (SNF) in the island country, and called for a suspension and complete re-examination of an approved plan by the Taiwan Power Co. (TaiPower) to do so by 2045.

The Control Yuan’s investigative report is remarkable and possibly ground-breaking in its finding that Taiwan’s geography basically

precludes it from building a permanent SNF repository. And it underscores the potential hazards for other governments moving ahead with repository plans based on shaky legal foundations and even shakier geological assumptions, or new nuclear programs that contain no long-term solutions for waste.

TaiPower’s 2017 feasibility report on an SNF disposal plan first approved in 2006, was largely formulated around materials supplied by the Swedish Nuclear Fuel and Waste Management Company (SKB), even though the geological conditions in Nordic countries are vastly different from those in earthquake-prone Taiwan, according to the Control Yuan’s report.

The report concluded that “a repository constructed 500 meters deep would be exposed on the surface after only 50,000 years” and that “therefore, a final high-level radioactive waste (HLRW) repository site cannot be found on Taiwan’s main island.”

The report by three Control Yuan commissioners was approved Sep. 9 by a combined meeting of the organization’s fiscal, economic, and educational affairs committees, according to an official statement Oct. 12. The Control Yuan called on the Ministry of Economic Affairs (MOEA), TaiPower and the AEC to suspend and “thoroughly re-examine” the 2017 plan, a version of which was approved by the Atomic Energy Commission (AEC). With 29 commissioners, the Control Yuan is a co-equal branch with the executive and legislative branches, but while its findings carry considerable weight it cannot order a halt to Executive Yuan policies.

At present, TaiPower has over 19,000 SNF assemblies stored in reactor vessels or spent nuclear fuel pools in three nuclear power plants at Taiwan’s northern and southern tips.

During an Oct. 12 news conference at the Control Yuan in Taipei City, Control Yuan Commissioner Tien Chiu-chin related that the report offered four recommendations to both the MOEA and TaiPower and to the AEC, Taiwan’s nuclear safety regulator. These will be presented alongside the findings at a joint meeting between the Executive Yuan, Taiwan’s Cabinet, and the Control Yuan in December, she told Energy Intelligence.

The repository plan was first proposed by TaiPower in 2004 and approved by the AEC in 2006. The blueprint was to be carried out in five stages that would identify potential sites, carry out feasibility and safety evaluations, and end with the construction and initiation of test operation of a final repository in 2045 at a cost of NT\$44.9 billion (in 2008) or NT\$56.1 billion in 2020 terms.

However, Tien told Energy Intelligence Oct. 26 that “after 15 years, it is very hard to see it will result in an operational and safe final repository by 2045.”

Given that SKB has long been regarded as a global leader in SNF repository work it’s perhaps understandable that TaiPower turned to the Swedish utility-owned organization for advice on its 2017 feasibility study. But the result was that geological conditions in

the Asian island country, which features “an active orogenic zone in which crust movement is very severe,” were largely ignored.

Moreover, Tien said that the geophysicists consulted for the Control Yuan’s investigation related that as the crust in Taiwan’s Central Mountain Range continues to rise by one centimeter annually, conditions do not permit the construction of a repository that would be secure for 100,000 years, much less the 1 million year storage period standard used in the United States, because a repository 500 meters underground would be exposed to the surface in half that time.

Wasted Funds

The report also criticized TaiPower and the AEC for insufficient dialogue with Taiwan citizens and the lack of legal foundations for the repository program, which impeded the plan’s key objectives, including the search for a suitable site for an underground research laboratory. TaiPower and the AEC created a “series of paper exercises” and “wasted funds of the Nuclear Back-End Fund (NBER)” set up by the MOEA with a surtax on power generated by nuclear power plants to finance decommissioning and repository operations, the commissioners stated.

Therefore, the Control Yuan called on the AEC to promote legislative work to enact needed laws as soon as possible. At the Oct. 12 news conference, Tien stated that the relevant agencies “must seriously face the geological problems and re-examine the high-level radioactive waste final repository plan” and “not just spend funds according to the current schedule.”

Tien told Energy Intelligence that the Executive Yuan should suspend the current plan, “stop, look and listen,” and bring all related agencies together to evaluate “what workable options we actually have if we cannot achieve an one million year or even a 100,000 year repository” and “let the people know what’s at stake and what the actual choices are.”

The report urged the MOEA and TaiPower to prioritize the establishment of an underground research laboratory in order to determine the stability of geological conditions, proactively carry out full disclosure and engage with the public in multichannel dialogue on the content of final repository planning. It also called on the AEC to “accelerate the enactment of legislation” for the siting, construction and management of a HLRW repository and to review safety frameworks for interim dry storage facilities.

TaiPower’s Response

In its response, a TaiPower spokesperson said Oct. 12 that the utility would “humbly re-examine and endeavor to improve based on safety as the highest priority” and will expand public dialogue. The spokesperson added that in 2020 the utility revised its estimates of needed expenses for the repository project based on current government policy and new international technology and knowhow.

The TaiPower spokesperson related in the same statement that seven districts so far consulted, including New Taipei City as well as Penghu County and Kinmen County, have opposed even being considered for site selection. Beyond that, political resistance by the New Taipei City government to dry storage made it impossible to shift spent nuclear fuel out of the Chinshan and Kuosheng nuclear power plants, and had resulted in some reactors being retired from service “earlier than scheduled.”

Green Citizen Action Alliance secretary-general Tsui Su-chin told Energy Intelligence Oct. 27 that the Control Yuan report “is an important reminder to the government, especially the MOEA and AEC, that we need to cease spinning in air and accelerate dealing with this problem.” Tsui added that the Democratic Progressive Party government should launch a participatory national level discussion on the question of nuclear waste disposal.

Many analysts worry that prospects for any near-term progress on a final repository are slim to non-existent. Thomas Chan Shun-kui, an environmental lawyer and former deputy minister of Taiwan’s Environmental Protection Administration (EPA), told Energy Intelligence that “there is not likely to be real progress toward a final repository for 10 to 20 years,” while welcoming a consensus-based approach.

Dennis Engbarth, Taipei City

HUNGARY

Paks II Progresses Despite EU Sanctions

The first concrete will be poured for the inaugural VVER-1200 at the Paks II nuclear plant in Hungary next year, with both Rosatom-supplied units slated for commissioning in 2029 and 2030, according to an official with project owner Paks II Ltd. Project planners aren’t seeing any significant impacts of EU sanctions on the project, which has proceeded at a rapid clip since Prime Minister Viktor Orban’s party won the April Parliamentary elections.

Attila Hügyecz, the chief economic advisor to state-owned Paks II Ltd., delivered this update to the Oct. 18 NNWI Forum 2022 in London as part of a broader effort to explain the controversial project, which Orban’s opponents had pledged to review had they won. Most of the forum’s audience consisted of nominal Hungarian allies, given their shared EU affiliation, even if many found Orban’s continued dealings with Russia distasteful. Separately company officials last week hosted a two-day English-language event with the European Utility Requirements (EUR) organization where they outlined the safety case for the new-builds. The project was granted a construction license by the Hungarian nuclear regulator Aug. 31.

Paks II is the last remaining Russian-supplied nuclear newbuild project in the EU, following the cancelation of Finland's Hanhikivi-1 VVER-1200 project this spring. Hungary is one of several countries straddling the growing geopolitical divide that's split much of the global nuclear business; fellow Nato member Turkey is similarly continuing work on its Akkuyu plant, with four Rosatom-supplied VVER-1200s. And Uzbekistan, which signed a nuclear cooperation agreement with Hungary at the beginning of October, continues talks over buying its own VVER-1200 from Rosatom while also attempting to stay neutral in the broader geopolitical dispute between Russia and the West.

Hungary, however, must navigate the EU's anti-Russian financial sanctions in a way Turkey and Uzbekistan aren't required to. But Húgyecz claims these present only minor irritations.

"Basically we have no serious problems" with EU sanctions, Húgyecz told the London forum hosted by the New Nuclear Watch Institute, in response to an Energy Intelligence question. "We have minor difficulties" such as banks sometimes being "over-compliant" and wary of transferring money to a Russian entity such as Rosatom. "They have fears, then they think twice. But this is really an over compliance." Beyond that it is more difficult traveling to Moscow; now Paks II officials must travel there via Turkey. "This is the magnitude, basically, which we face currently: we don't see huge difficulties."

Ramping Up

In the months since the April elections, considerable progress has been made on Paks II. Most interesting, however, was Orban's decision to shift project oversight. Former Paks worker Janos Suli had been the project's minister without portfolio, reporting directly to Orban, but in May he was demoted, and the project was brought under Foreign Affairs and Industry Minister Peter Szijjarto.

It's not clear whether this was because of the project's geopolitical nature and its implementation challenges, or because Orban trusts Szijjarto to speed progress. But by September Suli had resigned, and Szijjarto had stepped up his critique of project implementation.

"When we signed the agreement on the construction of the Paks nuclear power plant in Moscow in 2014, my son Patrik was born the next day," Szijjarto told an ATV news program on Sep. 2. "Now, Patrik starts the second grade of primary school tomorrow. I believe that Paks II [is] a very complicated thing. But it's not so complicated that nothing happens from the time a child is born to the second grade."

Those comments came only days after Hungarian nuclear regulator OAH approved a construction license for the Paks II-1 reactor building and six further buildings on the nuclear island. On Oct. 3 manufacture in Russia began on the 11-meter-high, 330 ton reactor vessel, "under the continuous control of Russian and Hungarian specialists," said Paks II Ltd. Until this point very little early site works had been allowed, so construction is only now ramping up on site. "Assembly workshops and storage areas are being built," said Húgyecz, "and we have just finished a big excavation to minus five meters, and soon we are going to start soil improvement and slurry wall construction."

Most interesting is the fact that the project's European partners remain, unlike in Egypt, where GE's turbine division was apparently replaced by Korea Hydro & Nuclear Power for supply of the turbine islands to the four planned VVER-1200s. GE is still slated to supply Paks II with turbine-generator sets, according to Húgyecz. And a consortium of Germany's Siemens and EDF subsidiary Framatome is set to supply the "main and upper-level" instrumentation and control systems. Smaller supply contracts are also spread across the EU, with the soil improvement and wall construction to be done by "a German company" and site earthworks by Hungary's Duna Aszfalt.

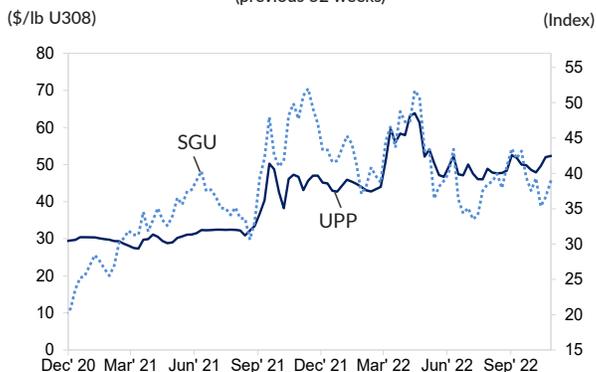
"This is a truly international project," said Húgyecz. Some 55% of the engineering, procurement and construction contract price must be procured via public tenders in line with the EU, and "we send every month the procurement report to the European Commission about ongoing, closed, and new procurement proceedings."

Phil Chaffee, London

URANIUM MARKET UPDATE

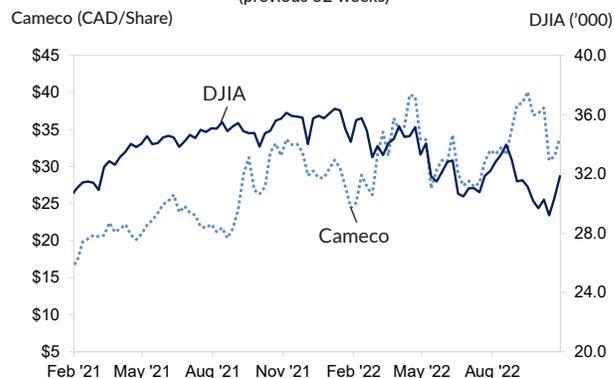
All prices as of Thursday, October 27, 2022

UPP VS. SOLACTIVE GLOBAL URANIUM INDEX
(previous 52 weeks)



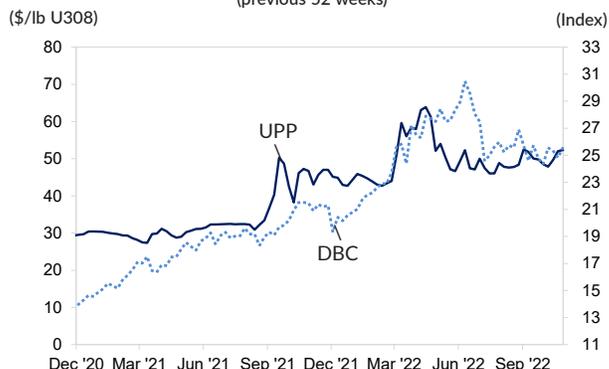
The Solactive Global Uranium Total Return Index, created by Structured Solutions AG, tracks the price movements in shares of companies active in the uranium mining industry. Calculated as a total return index and published in US\$, its composition is ordinarily adjusted twice a year.

CAMECO VS. DOW JONES INDUSTRIAL AVERAGE
(previous 52 weeks)



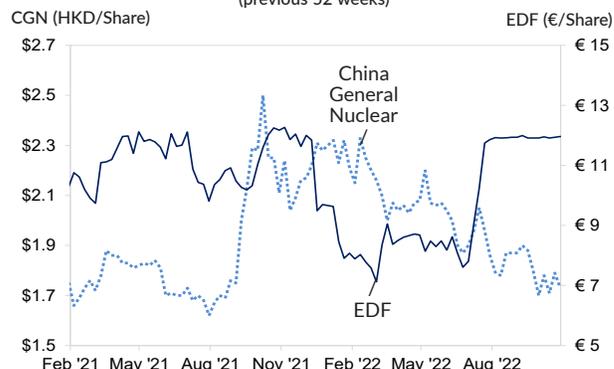
Canadian uranium miner Cameco's stock is valued in Canadian dollars compared with the US dollar on the Dow Jones Industrial Average (DJIA). Roughly two-thirds of DJIA's 30 component companies are manufacturers of industrial and consumer goods. The others represent industries ranging from financial services to entertainment.

UPP VS. POWERSHARES DB COMMODITY INDEX
(previous 52 weeks)



The PowerShares DB Commodity Index Tracking Fund is designed to provide investors with a broadly diversified exposure to the returns on the commodities markets. It is based on the Deutsche Bank Liquid Commodity Index, which is composed of futures contracts on 14 of the most heavily traded and important physical commodities.

EDF VS. CHINA GENERAL NUCLEAR
(previous 52 weeks)



The stock valuation of France's Electricite de France (EDF), largely owned by the French state, is in euros compared to state-owned China General Nuclear (CGN) Power Co., valued in Chinese yuan renminbi. Both companies build nuclear power facilities, design and service reactors, operate nuclear reactors and supply nuclear components and technology.

MONTHLY SPOT MARKET PRICES

	Chg.	2022									2021		
		Sep '22	Aug '22	Jul '22	Jun '22	May '22	Apr '22	Mar '22	Feb '22	Jan '22	Dec '21	Nov '21	Oct '21
Uranium (\$/lb U3O8)													
Low	+1.00	48.50	47.50	45.50	45.50	46.00	52.50	51.00	42.50	43.00	42.00	43.00	36.00
High	-1.00	52.50	53.50	50.50	52.50	54.00	64.00	60.00	44.50	46.50	47.00	47.50	48.00
Conversion (\$/kgU)													
Low	-	36.00	36.00	32.00	30.00	30.00	28.00	26.00	16.00	16.00	16.00	15.00	16.00
High	-	39.00	39.00	37.00	33.00	33.00	30.00	28.00	17.00	17.00	17.00	18.00	19.00
Enrichment (\$/SWU)													
Low	+2.00	92.00	90.00	89.50	84.00	84.00	82.00	100.00	59.00	57.00	56.00	56.00	55.50
High	+4.00	96.00	92.00	95.00	150.00	150.00	150.00	150.00	61.00	59.00	57.00	57.00	57.50

NIW monthly UF6, SWU and U3O8 prices rely on the general consensus of direct market participants and is informed by actual market transactions. This section was previously known as the Nukem Weekly Report and the Nukem Price Bulletin. The methodology for NIW's weekly UPP price is different - more information about the methodology behind that price is available on page two.